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Magmatic gas flux emissions from Gorelyi volcano, Kamchatka, and implications for volatile recycling in the NW Pacific

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The Kamchatka peninsula, in the north-western part of the Pacific 'Ring of Fire', is one of the most active volcanic realms on Earth, with 29 historically erupting volcanoes along its ∼700 km-long Eastern Volcanic Belt (EVB). This notwithstanding, volatile input and output fluxes along this arc sector have remained poorly characterised until very recently. We here report on the very first assessment of volatile flux emissions from Gorelyi, a large (25 km3, 1830 m high) and most active shield-like Holocene volcano located on the southern segment of the Kamchatka EVB. By combing results from a variety of in situ and remote sensing techniques (MultiGAS, filter packs, and UV camera), we determine the bulk plume molar concentrations of major (H_2O 93.5%, CO_2 2.6%, SO_2 2.2%, HCl 1.1%, HF 0.3%, H2 0.2%) to trace-halogens (Br, I) and trace-element volatile species, and we estimate a total gas release of ∼11,000 t/day from Gorelyi during ∼900°C non-eruptive degassing. Using this observation, we derive new constraints on the abundances and origins of volatiles in the subduction-modified mantle source feeding magmatism in Kamchatka.